

ABSTRACT OF THE INVENTION

Disclosed are reverse transcriptase molecules which are capable of synthesizing nucleic acids using a template polynucleotide and a nucleotide primer, such that the nucleotide primer provides a free 3'-OH and the nucleotide comprising the free 3'-OH does not need to be paired with a complementary base on the template polynucleotide. Preferred reverse transcriptases are pFOXC2-RT and pFOXC3-RT, which are derived from the mitochondria of the fungus *Fusarium oxysporum*. Also disclosed are improved methods of making long or short cDNAs using the reverse transcriptases derived from the mitochondria of the fungus *Fusarium oxysporum*. Also disclosed are polynucleotides and recombinant vectors that encode the reverse transcriptases derived from the mitochondria of the fungus *Fusarium oxysporum*.